Kongeriget Danmark

Patent application No.: PA 2002 00375

Date of filing: 13 March 2002

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Title: O-pen
IPC: -
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08 April 2003

f. Pia Høybye-Olsen

PATENT- OG VAREMÆRKESTYRELSEN

1. O-pen patent

2. Patent ansøgning

3. Patent krav

Krav nummer 1
Udformning af en Touchscreen, der positionerer en pen spids ved hjælp af optik og et digitalt fotobagstykke, der opfanger lysudbredelsen fra pen spidsen i en skærms dæklag.

Krav nummer 2
Farvedifferentiering af linser, der opfanger lyspletter fra en pen spids gennem dæklaget og projicerer dem let forskudt ned på et digitalt fotobagstykke.

Krav nummer 3
Flere lag af let forskudte linser, der tilsammen danner en række lyspletter som kan analyseres digitalt og dane baggrund for positionsbestemmelse med høj præcision.

Krav nummer 4
Farvedifferentiering af lyspletter fra en pen, der udbreder sig gennem dæklaget ved hjælp af farvede spejle på dæklagets sider med det formål at forøge afstanden mellem punkterne og dermed opløsningen.

Krav nummer 5
Brug af to spejle, der henholdsvis spejler over og under en fælles bølgelængde, således at en refleksion fra det ene spejl til det andet og vice versa altid forsvinder.

Krav nummer 6
Brug af to eller flere farvedifferentierede linser, der er rettet ud af dæklagets kanter for at opfange farvedifferentierede billeder, til grundlag for triangulering. Spejle projicerer billedet ned på et digitalt fotobagstykke, der ved hjælp af software danner en positionsbestemmelse.

Krav nummer 7
Pen, der opsamler omgivende lys gennem et transparent filter over hele overfladen og sender det ned i touchscreen dæklaget.

Krav nummer 8
Pen med indbygget lyskilde.

3.1 Opfindelsens formål

Det ansøgte patent omhandler en opfindelse til skabelse af touchscreens både internt i apparater og eksternt uden for apparater ved hjælp af fotografisk teknik.

3.2 Intern og eksterne touchscreens

Der kan ved hjælp af opfindelsen skabes tre forskellige typer af touchscreens samtidigt:

1. Intern touchscreen som på PDA'er mobiltelefoner og pen-computers.
2. Ekstern interaktiv touchscreen i sammenhæng med en projiceret computerskærm.
3. Ekstern aktiv touchscreen i sammenhæng med en flade som f.eks. et papir, et digitizer print, en tavle eller et maskininterface til f.eks. køleskabe biler etc.

4. Intern touchscreen

Den interne touchscreen skabes ved at fotografere lys afgivet fra en pen ned gennem dæklaget over en skærm.

4.1 Udformning af den anvendte pen til touchscreen

For at udforme produktet så simpelt og billigt som muligt søges det at undgå bevægelige dele, elektronik, batterier, dioder etc.

4.1.1.1 Passiv lysindsamlende pen

I én foretrukken udførelsesform samler pennen det nødvendige lys sammen ved lysinstråling i pennens transparente overflade.

4.1.1.2 Aktiv batteriforsynet lysafgivende pen

I en anden udførelsesform forsynes pennen med en intern lysgiver.

4.1.1.3 Aktiv opladelig lysafgivende pen

I en tredje udførelsesform oplagres energi, der afgives som lys. Dette kan ske gennem opvarmning af et emne inde i pennen som derefter i en periode afgiver IR stråling. Opvarmingen kan i én udførelsesform ske via en mikro mikrobølge ovn i apparatet. I en anden udførelsesform kan opvarmningen ske ved friktionsenergi tilført af bruge ved hurtigt at føre pennen frem og tilbage med et højt tryk henover et emne med høj friktion som f.eks. papir. I en tredje udførelsesform kan pennen oplades ved magnetisk induktion indbygget i apparatet. I en fjerde udførelsesform kan pennen oplades ved mekanisk at pumpe den op og ned, hvorved et spindende hjul i pennen via en spole ved hjælp af magnetisk induktion opvarmer et emne, så det udsende IR i det ønskede spektrum og med

den ønskede amplitude. I en sjette udførelsesform udsendes lyset fra en lysdiode, der tilføres energi fra et indbygget batteri eller en af de fem foregående metoder.

4.1.1.4 Aktiv radioaktiv lysafgivende pen

I en fjerde udførelsesform er pennen forsynet med en lavradioaktiv spids, der udsender lys med bølger, der er kortere end det synlige spectrum.

4.1.1.5 Enkelt klik og dobbelt klik m.m.

Pennen udføres således at det er muligt at udføre klik, dobbeltklik og "højreklik". Dette gøres I en foretrukken udførelsesform mekanisk eller elektronisk ved at afbryde lyset og således "Morse" signalet til driveren. I en mere simple udførelsesform gennemfører brugere simpelthen "Morse" signalet. I en udførelsesform anvendes en anden pen eller en finger som ekstra input til driveren. Alle disse input muligheder kan I en foretrukken udførelsesform programmers til driveren af brugeren selv.

4.2 Een linse til at se lyspletter fra pennens spids

Lysletterne fra pennens spids ses i en udførelsesform gennem dæklaget via én linse, der med fordel kan filtrere lys, så der kun kommer en sammenhængende del af lysets spektrum igennem. Med fordel kunne det spektrum, der kommer igennem være mere langbølget eller mere kortbølget end det synlige spektrum UV, da det derved frigør CCD'ens billeddannende kapacitet i det synlige lys spektrum. Herved bliver CCD'en istand til samtidigt at fungere som et almindeligt web-cam.

I udførelsesformen med én linse skabes der flere farvedifferentierede punkter ved hjælp af spejle i kanterne med selektiv farvedifferentieret spejling. Siderne kan opdeles i f.eks. to farver. Lyset fra spidsen af pennen trænger ned igennem dæklaget og spejles derfra 360 grader rundt. Én plet ses direkte, de tre øvrige pletter bliver synlige med hver deres farve. Og der opstår ikke flere lyspletter , da pletter, der reflekteres fra et spejl til et andet spejl forsvinder, idet spejlene skærer skarpt således at ved første spejling forsvinder alt lys under et punkt og ved næste spejling forsvinder alt lys over det samme punkt.

De lysende pletter, der passerer igennem linsen rammer en CCD eller en anden tilsvarende digital fotoregistreringsenhed.

4.2.1.1 Spejlrefleks system til CCD

Foran denne CCD er der i en udførelsesform placeret med et spejl svarende til spejlrefleks kameraer. I fortrukne udførelsesformer er CCD'ens følsomhed hævet ved at sammenstøbe den med dæklaget.

4.2.1.2 Flere linser placeret forskudt over hinanden

For at skabe flere punkter til beregning af penspidsens position og dermed at forøge skærmens opløsning uafhængigt af det digitale fotobagstykkes opløsning, så kan der med

fordel arbejdes med flere letforskudte linser over hinanden. Således at hver lines danner et let forskudt billede af de samme punkter I hver deres niveau på det digitale fotobagstykke.

4.3 Flere farvedifferentierede linser til at se lyspletter fra pennens spids

Pletterne ses i en udførelsesform via flere linser, der med fordel kan filtrere lys, så der kun kommer en enkelt del af lysets spektrum igennem. Med fordel kunne det spektrum, der kommer igennem være mere langbølget eller mere kortbølget end det synlige spektrum. Hver linse genererer pletter med hver deres bølgelængde.

4.4 Flere CCD'er og linser til at se lyspletter fra pennens spids

I en udførelsesform er der placeret mindst to indbyrdes forskudte CCD'er med hver sin linse, således at det er muligt at gennemføre en triangulering.

4.5 Calibrering af intern skærm

De farve differentierede pletter på CCD'en benyttes til at foretage en digital beregning af den lysende penspids berøringspunkt. Dette sker ved hjælp af en calibrering af skærmen.

Calibreringen foregår ved at måle med en pen, hvornår punkterne på skærmen under dæklaget opdateres. Lige i det øjeblik punktet under pennens spids opdateres, så ved CPU nøjagtigt, hvor pennen er placeret samtidigt med at CPU'en også har information fra CCD'en eller CCD'erne om hvor de respektive pletter er. Det betyder ikke noget om pletterne er udtværede som følge af fokusproblemer, idet det afgørende blot er at de muligvis udtværede pletter blot repliceres som sådan hver gang pennen igen kommer til det samme punkt calibreringen kan foretages én gang og derefter kodes ind i driverens software. Hvis produktions præcisionen er tilstrækkelig høj er det nok at calibrere et enkelt referenceprodukt. Det er således muligt at kalibrere f.eks. en mobil telefonskærm med en superopløselig skærm og så derefter at bevare denne superopløsning, selvom den pågældende mobiltelefon efterfølgende leveres med en prisbillig skærm med lav opløsning.

CCD'ens optagelse og CPU'ens positionsbestemmelse udnyttes af driversoftware.

4.6 Polariseringsfiltre til skærm

For at sikre mindst mulig interaktion med udefra kommende lys polariseres lyset fra dæklaget over skærmen og linsen eller de linser, der transmitterer lys til det digitale fotobagstykke polariseres modsat. Herved opnås at lyset fra pennen og det omgivende lys er det eneste lys, der når frem til digital registrering.

4.7 Tintning af skærm

For at sikre den rette lysudbredelse i 360 grader udføres skærmen med en tintning bestående af ensartede urenheder i dæklaget, der spreder lyset ved refleksion.

4.8 Afskærmning af skærm

For at undgå uønsket lysindstråling i skærm, så forsynes skærmen med et selektivt filter, der afskærer uønskede bølgelængder. Der kan f.eks. være tale om langbølget IR svarende til det der afgives fra pejse, varmeapparater etc. således at der bliver mindst mulig uønsket interferens med almindeligt forefinde IR stråling. I praksis vil kun lys fra direkte lyskilder kunne inducere de uønskede IR strålinger, der vil kunne udgøre et problem for detekteringen.

4.9 Coating af skærm

For at reducere de vinkler, hvor lys kan trænge ind i skærmen, forsynes skærmen i en udførelsesform med en coating, der spejler udefrakommende lys i højest mulige vinkler. Formålet er at nedsætte indstråling fra uønskede udefrakommende lyskilder.

5. Deling af CCD ved hjælp af skiftevis opdatering

I en udførelsesform skifter CPU'en mellem interne og eksterne skærme samt Web-cam function ved at lukke af for de to andre input. Dette gennemføres ved hjælp af en elektronisk blænding, hvor en plast efter tilførelse af spænding bliver uigennemtrængelig for lys. Denne udførelsesform åbner for muligheden af at udføre touchscreen funktionaliteten uden farveseparering og uden at bevæge sig udenfor det synlige felt.

6. Ekterne skærme

Der kan oprettes tre typer eksterne skærme:

1. Relative position skærme
2. Calibrerede aktive skærme
3. Calibrerede aktive template skærme
4. Calibrerede interaktive skærme

6.1.1.1 Relative position skærme

Oprettelse af eksterne skærme sker i en udførelsesform ved hjælp af to eller flere farvedifferentierede linser, der opfanger lys i et 2D felt. Bag hver linse placeres et spejl i dæklaget, der projicerer lyset fra hver sin farvedifferentierede linse ned mod een eller i nogen udførelsesformer flere linser foran CCD'en, hvor de danner to punkter eller i nogen udførelsesformer flere punkter.

Skærmen skal ikke calibreres, idet der kun måles relative positioner. Det er muligt at placere iconer på skærmen og arrangere disse frit. Dette gøres ved at hente iconerne fra den interne skærm og placere dem på den aktive skærm. Når der trækkes i iconerne, så flyttes de og når der peges på dem gennemføres de kommandoer, der er associeret med dem. Denne skærmtype gør det muligt at styre apparater med indbygget O-pen teknologi og via disse apparater også alle de apparater, der kan tilknyttes disse via f.eks. Bluetooth og internet.

6.1.1.2 Calibrerede aktive skærme

Et bord en væg eller et stykke papir på en template kan fungere som en aktiv skærm meget lig en digitizer. Dette gøres ved at printe et billede fra CPU'en inklusiv calibreringspunkter og de ønskede iconer og benytte det som underlag for den aktive skærm. Iconernes kommandoer programmeres via den interaktive interne skærm, hvor det også er muligt at definere skjulte kommandoer. Når skærmen tages i anvendelse markeres alle de udprintede calibreringspunkter, hvorefter CPU'en beregner deres position og via driversoftwaren sørger for at der udføres de dertil associerede kommandoer.

6.1.1.3 Calibrerede aktive template skærme

Disse skærme er en kombination af relative position skærme og calibrerede aktive skærme. De etableres ved at fastgøre et apparat med indbygget O-pen teknologi i en dertil fastlagt position således at et skærm felt derved bliver prædefineret. På templaten kan der over et print lægges et stykke plast, hvorpå der kan skrives.

6.1.1.4 Calibrerede interaktive skærme

Disse skærme etableres ved hjælp af for- eller bagprojicerede skærme. Calibreringen forgår ved hjælp af, at CPU'en genererer calibreringspunkter som brugeren derefter fører pennen til og krydser af efterhånden som punkterne passeres. Herved bliver O-pen teknologiens altid aktive relative positionering låst sammen med den CPU genererede absolutte positionering. Disse calibrerede interaktive skærme arbejder fuldstændigt som en klassisk computer skærm selvom de er projicerede. Det betyder at det er muligt i møder at forvandle en hvid væg eller et white board til en interaktiv skærm. Hvis O-pen teknologien er indbygget i en af deltagernes mobil telefoner, så sker det blot ved at montere telefonen og så lade den om at registrere hvad der sker på skærmen og transmittere det til alle deltagere, via Bluetooth til telefoner og computere og videre derfra via internet og intranet.

7. Driver funktionalitet

Driveren har til formål at oversætte brugerens intentioner til kommandoer, der forstås og udføres korrekt af computeren. Af hensyn til brugerens behagelighed og dennes produktivitet, så skal driveren kunne programmers til individual opsætning.

Indbyggede og ikoner og brugerdefinerede ikoner skal af brugeren kunne specificeres til at udføre bestemte kommandoer.

7.1.1.1 Telefontavle

Når der bladres I den interne telefonbog fremkommer der en række forskellige segmenterings muligheder: køn, alder, gruppe, hårfarve osv. Efter brugerens mulige

segmenteringsparametre. Når een kontakt highlightes fremkommer der et ikon. Dette ikon er et "ur" når pennen føres rundt om uret, så fremkommer der forskellige informationer afhængigt af det hieraki brugeren har specificeret eller hvis der intet er specificeret, så med en default udgave af hierakierne. Brugeren kan f.eks. have indkodet foto af den pågældende. Det samme kan virksomheder, der ønsker at præsentere sig brugervenligt overfor kunder og øvrige relationer. I en ydre ring kan brugeren gennemføre kommandoer. Klokken 12 kan være at ringe op, klokken tre være at sende mail, klokken 6 være at sende SMS, klokken 9 være at informere om at man er tilgængelig online og så fremdeles. Yderligere ringe kan tilføjes efter behov.

7.1.1.2 Lokalisationsafhængige software agenter

Brugerne kan via software agenter hente informationer og gennemføre bestillinger af informationer og varer. Det kan gøres via software agenter, der går ud på nettet og finder de udbydere af varer og serviceydelser, der er tilgængelige for brugerne indenfor et brugerdefineret afgrænset området nær den lokalisation brugeren aktuelt har eller forventer at få I fremtiden. Eksempelvis kan brugeren ønske at spise kinesisk klokken 20.00 og har på forhånd bestilt en rejse til Rom med afgang klokken 17.00 og forventet ankomst på hotellet udenfor centrum klokken 19.30. Brugeren kan nu få alle informationer om de kinesiske restauranter, der er lokaliseret indenfor en tidsmæssig afstand, der kan nås efter check in.

7.1.1.3 Brugerdefinerede ikoner og kommandoer

På samme måde kan brugeren fra et arkiv vælge ikoner og printe disse ud til anvendelse på en digitizer lignende template eller på en interaktiv skærm, hvadenten den er intern eller ekstern. Hele brugerens relation til apparatet kan customiseres for at lette interfacet og personliggøre brugerens kontrol med apparatet og gennem apparatet til hele den verden apparatet via Bluetooth og internet kan give brugeren adgang til at styre med touchscreen interfacet. Brugeren kan også selv tegne ikoner og associere dem med de dertil ønskede kommandoer.

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O-pen Business plan

Intuitive computer interface

Confidential

Jens Stubbe Østergaard & Jonas Eliasson 23 January 2002

O-pen business plan

1. Business information on O-pen

1.1 Founders, owners and director

Jonas Eliasson owns 75% of the commercial rights as the originator and the managing director. Jens Stubbe Østergaard owns 25% of the commercial rights as co-inventor.

1.2 Our vision with the O-pen project

Pointed tools drawing on plane surfaces has been a principal way of communication since the dawn of mankind and if Bill Gates is right the speedy pen computing concept will dominate the future of pc's. Microsoft is bringing their pen computer concept, Tablet PC, to the market this year along with a comprehensive software packet. So why come up with yet another pen-computing concept? In short we want to;

- Open for new possibilities through new audiovisual facilities in phones including on line film recording of dialog, text, items and sketches during meetings.
- Free consumers from tiresome and potentially health damaging interfaces such as the mouse by lowering the cost and expand the usability of pen computing.
- Improve productivity and sheer joy of using cellular phones, PDA's, game computers, laptops, desktops, televisions, VCR's, cars, cameras, machines etc.
- Expand the pen-computing idea further by using the O-pen technology to turn ordinary desks or paper templates into active touch screens and turn ordinary walls or whiteboards into interactive touch screens and by employing all these screens simultaneously in any Windows programme.
- Empower consumers to use their phones to communicate with every Bluetooth and Internet controlled device including payments for goods and services.
- Bring the O-pen technology to the market as a new industrial standard through a royalty agreement with a major industrial partner who is prepared to license the technology at reasonable low cost to their competitors.

1.3 Bank, accountant and attorney is not appointed

1.4 Patents

The O stands for optical meaning that O-pen is relying solely on optical measurement of relative positions on a surface. We have found concepts with some similarities but none with quite the same performance and technology. We haven't checked the patent literature nor have we filed a patent.

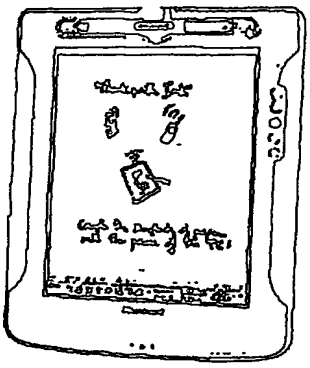
2. The technology behind the O-pen

2.1 The competition

In a broader perspective any interface solution ranging from the most primitive mouse to advanced eye response and voice recognition technology is a competing technology.

For practical reason we will only deal with competition who are delivering technology including pen and touch screen. The mouse, digitisers and so on is decidedly less interesting and the more advanced voice recognition and eye response interfaces are destined to work together with a general interface such as the one we propose.

A major competitor is Fine Point Innovation, which is appointed as technological partner by Microsoft in their Tablet pc concept.



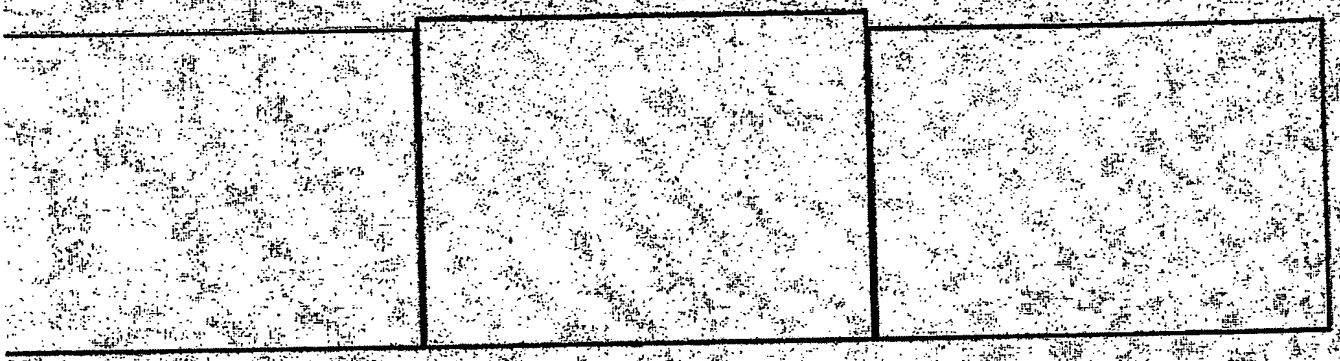
A Tablet pc is in the words of Bill Gates a fully functional Windows pc that affords you all the convenience and ease of use a traditional pen a paper does.
Finepointinnovations has delivered an advanced Pen that employ, a micro camera, power supply, microelectronics, various buttons and wireless interface. It works in pretty much the same way as an advanced wireless and optical mouse, which transmit images of the surface beneath the optics and let the CPU and the driver handle the relative movement calculation. Further precision is achieved by incorporating micro grooves to the screen on the Tablet pc. Only the screen it self can be controlled by the pen.

The Swedish company Anoto has taken this concept further with. They are able to work on any surface with an Anoto grid net. Meaning you can record every movement on specific paper surfaces. You are still dependant on specific surfaces with the appropriate grid net. Through your phone you are able to transmit directly on the Internet or via Bluetooth to nearby computer etc.

Finepointinnovations and Anoto is both dependant on a rather costly pen which the user always risk loosing or damaging.

The classic touch screens based on either resistive touch or capacitive touch has its well-known shortcomings. Both technologies are imprecise and expensive. And of course touch screen of this sort cannot be established wherever you please.

Mimio, ebeam, I-pen and others have taken a different approach to the process of defining a pens precise position. They employ the ancient navigation principle triangulation, which by the way is the very same way our brain gets distances right for us. In the modern version its done with signals produced with Ultrasound in combination with Infrared light pulses, which are processed by the CPU and the driver software.



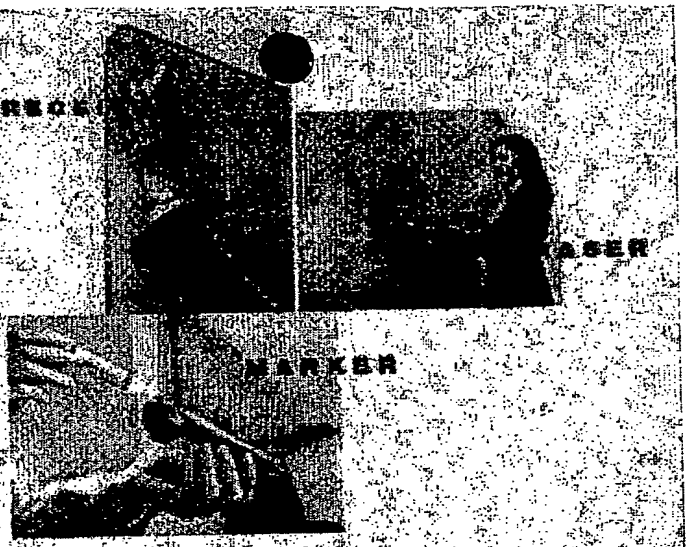
limio uses a combination of infrared and ultrasonic signals at 40KHz to localise the pens nd the eraser sponge. Infrared signals travel at the speed of light but ultrasonic signals nly at the modest speed of sound 330 meters pr. second. This means a measurable delay n reflected signals when detected by two sets of IR and ultrasonic sensors with 53 entimetres between them. The delay enables the computer to calculate the distance from ne sensors to the tip of the pen and the distance between the sensors creates the necessary riangulation angle.

eBeam is very similar to Mimio.

The eBeam system consists of three main components:

- Four marker sleeves,
- Two whiteboard receivers,
- One eraser.

The eBeam marker sleeve turns your standard dry-erase marker into an idea-sharing tool. Four Beam sleeves are included, one for each colour.



ıe sleeves send signals to the receivers, which
: mounted to the top of your standard
ıiteboard or any flat writing surface with the
e of suction cups. Each pod receives data from
e sleeves. The right pod sends the data to your
ımputer.

limio, eBeam and I-pen all share the same problems.

is not an inherit technology you are able to use directly on your computer screen. On the ontrary its an added very high priced facility you must bring along separately, wire and ıen calibrate before you are ready to work with it.

.2 The innovative part of the O-pen technology concept

he basic idea is as old as navigation at sea. If you have two known landmarks in sight be it ghthouses or satellites you are able to perform a triangulation. Instead of the human eye ve rely on the well-known digital equivalent CCD's used in any scanner, web-cam etc.

ıs you have seen there is not much difference between the competitions technology and he Technology employed in the O-pen concept.

We have however taken the basic technology concept further. Instead of trying to create et another technology application we have found a way to build in the sensor technology n ordinary consumer electronics by enabling a CCD to become a multitasking unit both erving as and ordinary built-in web-cam and a sophisticated 2D positioning system, which ely on one or several colour-separated lenses in the invisible infrared spectrum.

We rely on one or more colour-separated lenses to create dots on the CCD representing he position of pens in contact with the touch screen. The image of the dots is transported ıorizontally through the transparent screen.

The technology could work with only one lens. In that case we create three different dots ısing colour-separated mirrors at the edges of the touch screen. Two sides projecting dots of different colours and one dot are seen directly from the pen point by the CCD.

Screens with built in O-pen technology is calibrated once and for all. The precision should be possible to optimise to an accuracy comparable to any touch screen known to us.

It should be possible to use a cellular phone with built in O-pen technology to create an active external touch screen. (See Mimio, I-pen and eBeam) This could be on the users desk, a paper template or on a white board but the users will have to perform a simple calibrating procedure in order to create the touch screen.

Using a projected screen as an interactive screen is easy with an O-pen sensor (an ordinary cellular phone with O-pen technology). The computer projects an image with marking points and the user simply point out the marking points to let the CPU and the driver calculate the relative position of the marking points and the O-pen sensor.

Transforming a sheet of paper into an active screen such is equally simple the user simply point out the corners and let the CPU and driver software establish the relative positions. On a desk with user specified icons the user must point out each icon to let the CPU and the driver software calculate their position relative to the O-pen sensor and specify, which actions the icons are used to command. When the user returns to the desk the calibration is simpler because the relative positions of icons and their actions are saved. Complete sheets of icons similar to digitiser templates can be generated and printed by the CPU. In that case it's only necessary to identify the template and its relative position to make the icons work.

More screens could be attached to the same CCD if you transmit the sensor signal with image producing glass fibres. The only limit is the capacity to colour separate paired lenses and of course the processing speed and ability of the CPU.

Windows and other programmes support multitasking on several screens whenever you want to employ an extra screen all you need is an extra phone with O-pen technology. The built in Bluetooth interface in future phones makes it an effort- and wireless experience.

The O-pen technology only employs the infrared light spectrum. The rest of the visible light spectrum is left complete on disturbed. If you simply filter infrared photons the rest of the CCD's capacity could be used in an ordinary built in web-cam.

As you see all the necessary components for the O-pen technology is all ready present in the phones and laptops of tomorrow. The only hardware needed is a thin layer shielding the screen, an ordinary CCD, a CPU with some processing capacity, a motherboard including power supply and then an additional driver and a slightly modified web-cam optics. What's achieved by modifying the optics and by incorporating a different driver is:

- A touch screen
- Cheaper inactive cellular phone buttons, or for that matter on an ordinary desk or on your Tablet pc, laptop etc.
- Substitution of all track balls, touch pads, digitisers, pens and different mice including their drivers, connections and greedy power consumption by a super simple intuitive pen.

3. Market trends

The following statements are our beliefs about market trends and the drivers behind.

3.1.1 Phones and computers merge together

Nokia, Ericsson, Motorola, Siemens and others see UMTS as the next generation. This will mean that Internet, cellular phones and computers merge. Actually we foresee no major differences between phones, PDA's and laptops than their size and weight. Desk tops as we know them will cease to be produced.

3.1.2 Computers will be much more interactive

Consumers enjoy effort- and wireless communication via electronics. Bluetooth enables them to create his or her local network and share data with anyone within their range. Games and professional interaction will flourish and need the visual dimension and a versatile and precise on screen interface.

3.1.3 Integral parts of the desktops of today will become accessories

Keyboards, large screens, projectors, game consoles, additional software, safety back up and extraordinary computing power will become accessories you can access physically most anywhere or draw on from the Internet or a local net. We foresee that workplace desks will become a large combination of an active and a back projected interactive screen. And your computer will be your phone lying on the desk.

3.1.4 Moore's law is no longer applicable we are speeding up

Three years from now your phone/computer will be clocking away at least 10giga per second. And your storage capacity will be quite sufficient.

3.1.5 Most everything can be computerised

Cars, machines, clothes etc. is being computerised. A lot of devices will respond automatically but a growing number will need a computer interface as well.

3.1.6 Bill Gates believes in pen and touch screens so do we

High speed computing and the ever-growing visual element in computing and entertainment will mean higher demands on speed and accuracy. Microsoft and their partners prepare the introduction of Tablet pc because they believe that pen and touch screen will prevail over mice.

3.1.7 Consumers prefer disposable goods

The fundamental concept of very expensive computer interfaces is doomed. For every Mont Blanc pen sold thousands of BIC pens are sold. Super advanced pens remains the dream of few technology and design freaks the ordinary consumer wants a disposable pen you don't have to attend at all.

3.1.8 Built-in web-cams in any phone, PDA, Game boy or laptop

Consumers will demand the ability to take pictures and videos wherever and whenever they want. It will be a new form of communication and a tremendous driver behind the development of still higher quality in the mobile Internet.

3.1.9 Still higher picture quality

Built in web-cams in cellular phones will eventually compare favourable to a Hasselblad or a professional television camera of today in terms of both features and picture quality. The technology driver behind this drastic quality improvement is the ever-growing CPU capacity, advancement in picture analysing software and micro optics plus the ongoing improvement of CCD's according to Moore's law. The market driver behind the development is the billions of customers who will demand quality. The usability of pictures will rise dramatically. The Novamind software, which enables anybody to do precise 3D measurements based on a simple standard video recording, biomechanical identification of eyes, blood wanes etc. is just some examples. In the funnier department infrared pictures in combination with pictures in the visible spectrum can be combined by picture analysing software to create pictures and videos of humans seen without their clothes. All sorts of other picture analysing and animation methods will afford ordinary consumers far more advanced possibilities than professionals in Hollywood studios use to create films today.

3.1.10 Web-cams will become central to thousands of new services

Companies of any sort will invent new ways of using phones with advanced built in web-cams. Telemedicine with every sort of home diagnostics devices is a fast growing industry. Built in web-cams will allow patients to stay at home during their diagnosis because doctors can use the extra 3D communication dimension. The same goes for anybody taking expert advice while performing a task. Any craftsmen will use their phone as a ruler to measure 1D, 2D and 3D objects with digital precision and record ability.

3.1.11 Peer to peer sales of services

The new facilities will be followed by new market behaviour. The most notable will be the peer to peer sales of services meaning that individuals will start to order services directly from each other and making the payments via their respective phone companies.

3.1.12 New sources of income for phone companies

The phone companies will cease to charge for the use of phones and instead earn their money from, advertisement and small payment fees whenever a good or service is purchased with a phone. Orange is allready on the market with a secure system where the phone becomes a credit card. The built in web-cam will secure biomechanical identification and users will be able to gather offers with their phone and decide on purchase on the spur or later on. Old fashion wired phones will become obsolete because any cellular phone will be able to switch to DECT mode via Bluetooth whenever it's possible to connect to a local network with better capacity or higher transmission quality.

3.2 Who are the consumers and what is their need

Virtually every consumer will become our customer if the market trends we believe in are correct. We are confident that no other technology can compete in terms of price and performance because we exploit already existing components inside a modern phone, PDA or laptop to create the O-pen facility. The ordinary consumers really have no idea of the

technological possibilities; therefore they don't imagine what their needs really are. They are just as in content as ever with lousy computer interfaces but must make do with what they can afford and what's available at the market. To the left you see what we imagine users prefer and to the right we state some unique sales points of the ⓞ-pen technology:

Mobile	ⓞ-pen is built into cellular phones, PDA's and laptops where it substitutes quite a variety of components without adding any components so in a sense ⓞ-pen is weightless and dimensionless. It's a personal thing always at hand.
Intuitive	You just point to the screen with your pen then your command is completed. If you want to create and define your own icons and short cuts you just do so. If you need extra screens then it's a wire- and effortless task to turn your desk, a projected screen or a paper template into extra active or interactive screens.
Precise	You can write or draw as precise as you can with pencil and paper. Try writing your name with your mouse?!
Ergonomic	A pen is simply much less demanding to control. Intuitive precision means high speed. In short you will be able to do more work faster with less effort. For anyone used to work with a mouse this is relieving news.
Interactive	You can interact wireless via Bluetooth or the Internet and use phones, PDA's, lap-tops, desktops, projected interactive screens plus active screens like your desk or a sheet of paper. The potential for news methods of doing your job and collaborate with others is enormous.
Economic	No connections, no buttons, no wiring and no additional hardware we just make better use of inherit facilities in future phones, PDA, laptops etc. Even the simplest mouse is more expensive to produce when you include connections and wiring.
Durable	ⓞ-pen will not go broke as long as the motherboard, the CCD, the screen, the software and the Bluetooth interface is functioning properly.
Maintenance free	ⓞ-pen requires no specific maintenance apart from ordinary cleaning. There are no fragile parts or parts where a little dirt ruins the performance.
Disposable	The only thing that can go missing is a simple pen anyone can get hold of for a few cents.
Aesthetic	In the world of consumer electronics wireless, tiny, thin, light and built in are buzzwords - chunky, wired and separate boxes is undesirable.

3.3 Achievable royalty

The O-pen technology integrate high quality mouse, digitiser, touch screen and web-cam functions. The added value contributed from built in O-pen technology implies the possibility of a high royalty per piece strategy.

So does the strategic value to the major industrial player we want to negotiate an agreement with. After an agreement they will have a lead time and benefit from a first mover advantage.

The lowest possible price can be derived form a calculation of the difference between how much it cost to provide the cheapest possible interface technology and how much it cost to implement O-pen technology. A modern laptop needs web-cam, active buttons, track point, mouse and mouse port. A laptop with O-pen technology substitutes all of this with a slightly modified web-cam and a slightly modified screen glass plus an integrated photo sensor technique under the buttons.

3.4 The market in round numbers

The O-pen technology is a very cost effective and versatile solution to the inherit interface problem in all sorts of consumer electronics and professional machines

Approximately 700.000.000 phones, computers, PDA's and Game computers are sold annually. We believe nearly all of them will come with a built in web-cam and most of them will incorporate O-pen technology because it's adequate and cheaper than alternatives known to us even included our royalty.

The market for the O-pen technology is growing very fast as the large economies in the heavily populated areas in South East Asia, China and India is becoming computerised and because the visual elements in wireless communication is becoming increasingly important.

3.5 Marketing strategy

Our aim is to establish O-pen as an industrial standard and to maintain a part of the commercial rights. In order to do so we want to collaborate with a major industrial partner who is prepared to enter the market with a low price strategy and who is ready to license the technology to their competitors at a reasonable price.

3.6 Expected market shares

If we, as we imagine are able to become very competitive on both price and performance, we expect it's possible to reach a 100% market share in all consumer electronics with an integrated CCD and screen as well as a need for a user interface.

4. Organisation

4.1 The O-pen project organisation

Jonas Eliasson is as an architect trained in graphic and industrial design as well as architecture and has worked in all three fields.

Jens Stubbe Østergaard is educated in business economics with the cand. merc. degree from Copenhagen Business School. He is specialised in management of technology and design and is experienced as a project manager at Kontrapunkt the leading Danish design consultancy where he specialised in large corporate design programmes and industrial design. In recent years he has co-founded the company e-medication where his is also originator of a patented medicine compliance system.

Martin Straarup Rasmussen is participating on our advisory board as a technical advisor with all the needed competences in ingeneering and we are discussing a collaboration with Peter Olausson Who has the experiences and contacts with major industrial players. Their cv is attached.

Attorney and accountant are not appointed.

Both founders have an extended network of persons with the right sort of competences and connections needed to build an appropiate organisation. In the near future we will decide on a strategy and consequently decide how to expand the competences of the organisation.

We see two possible strategies at present;

1. Building up competence to find the best possible industrial partner
2. Finding one major industrial partner

4.2 Building up competence to find the best possible industrial partner

We add as much value to our innovation before we approach a number of major industrial players and optimise our bargaining power.

The scheme would look like this.

A review of the O-pen technology by independent professionals concerning:

- High precision plastic moulding
- Colour filters
- Colour dependant mirrors
- CCD's
- Advanced photo analysing

- Hardware drivers

A preliminary patent file based on our present technical descriptions and illustrations.

Purchase a range of consumer electronic products including adequate interface solutions in order to do a comparative test and prepare our concept presentation.

Engage an engineer to produce the first simple laboratory models and to perform a series of feasibility test before a fully operational laboratory model is produced to present the innovation and then finally to write a technical documentation.

Revised patent file.

Engaging professionals who are able to develop our business plan presentation and to find and negotiate a deal with the right industrial partners we seek.

4.3 Finding one major industrial partner

We invest only the little extra needed to go to one major industrial player.

The scheme would look like this.

A preliminary patent file based on our present technical descriptions and illustrations.

A review of the technological feasibility by knowledge full persons we know.

Purchase a range of consumer electronic products including adequate interface solutions in order to do a comparative test and prepare our concept presentation.

Engaging professionals who are able to develop our business plan presentation and to find and negotiate a deal with the right industrial partners we seek.

4.4 Conclusion on the issue of preparing the invention for sale

Both strategies have its advantages. Adding value to the concept through careful planned activities is more demanding in terms of the effort and investment we have to put into the process. Finding venture capital and the appropriate competences present it self as extra obstacles. The second strategy is less likely to optimise the possible economic outcome because we are unable to deal with more than one or two major industrial partners. And we have to consider the possibility of failure if we are unable to convince with our present level of technical documentation and business prospect. It is however the fast track to realisation if it works. We are sure we will be able to find the needed resources by using our personal network and by operating with success fees for the involved persons.

At the present we are unable to decide which strategy to follow or in other words we are open to a discussion of the critical path to success for O-pen technology concept.

5. Economics

5.1 Activities, milestones and budgets

We have no information of the outcome from our future negotiations with a major industrial partner we are only able to do a qualified guesstimate of our future royalty income. We have only little information concerning the time to market estimate. The same goes for the important question; is a phone, a PDA or a Lap-top cheaper to produce with O-pen technology than with an ordinary interface?

5.2 Capital need

If we decide to use the direct approach without further development of the concept, business plan, documentation and presentation we will need no funding since we are able to do so with our own resources.

If we decide to invest extra effort and time into creating a concept presentation with laboratory models and documentation we will need funding from a venture capitalist.

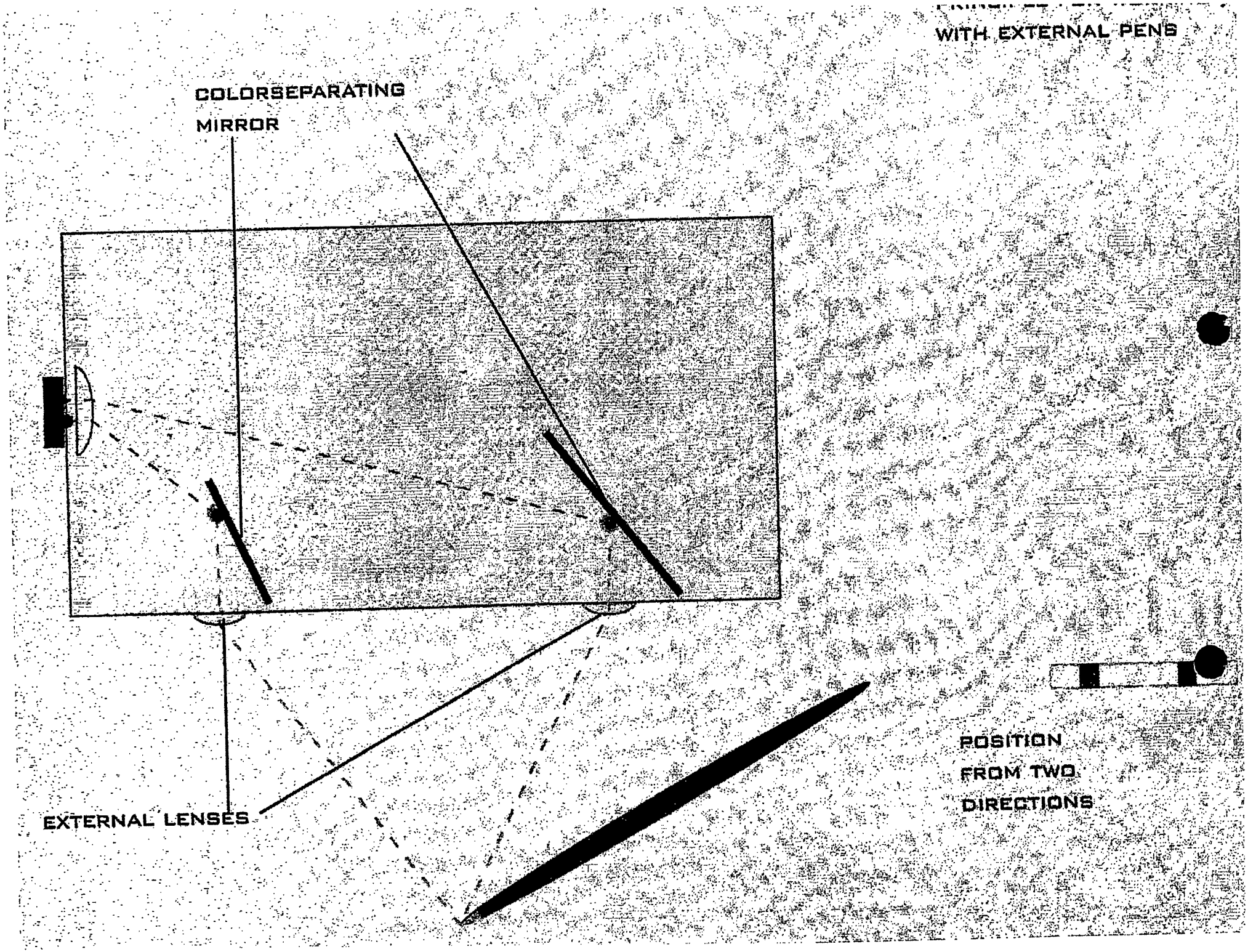
We have placed some scenarios in a separate spreadsheet.

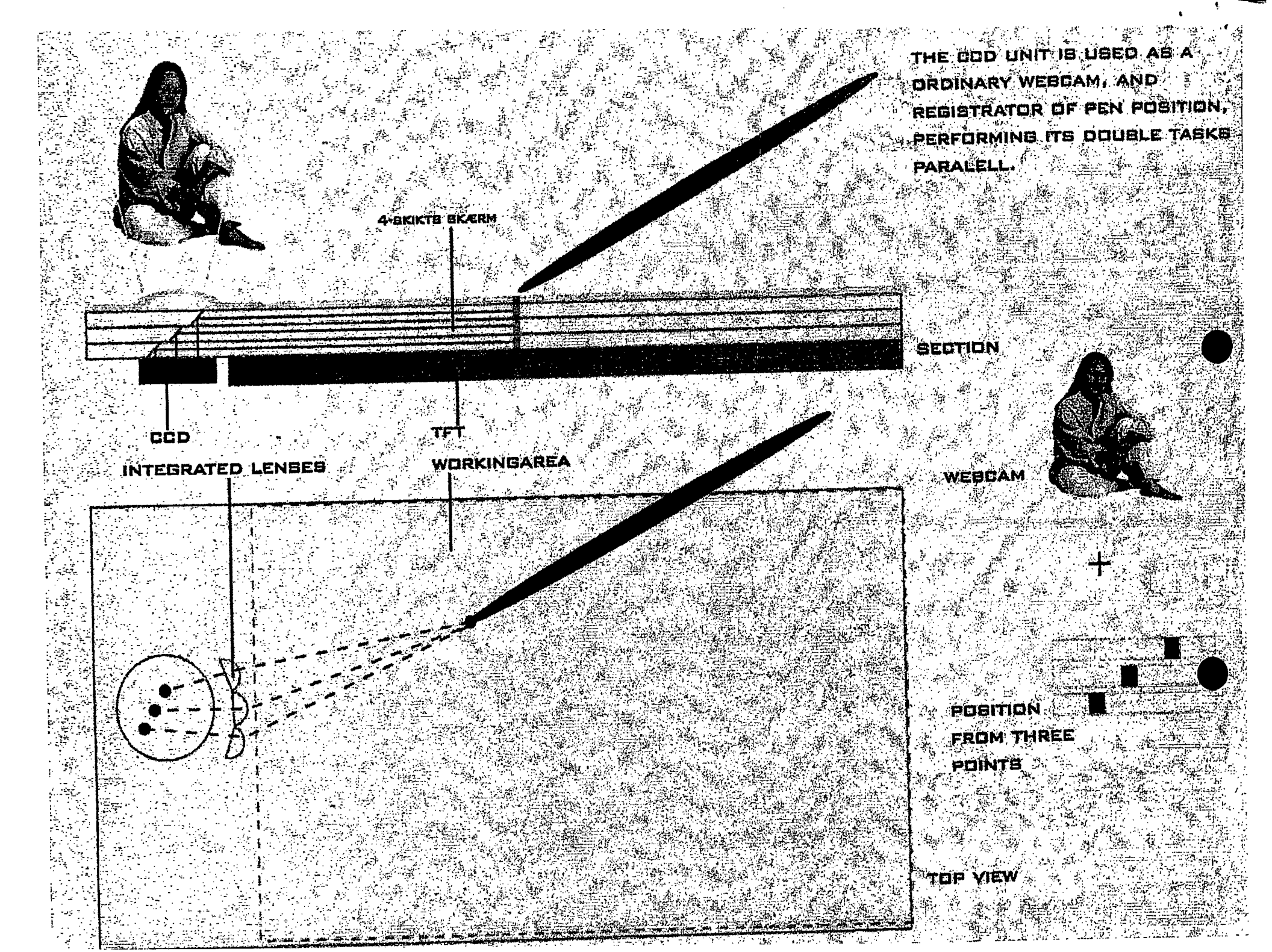
6. Feasibility scheme

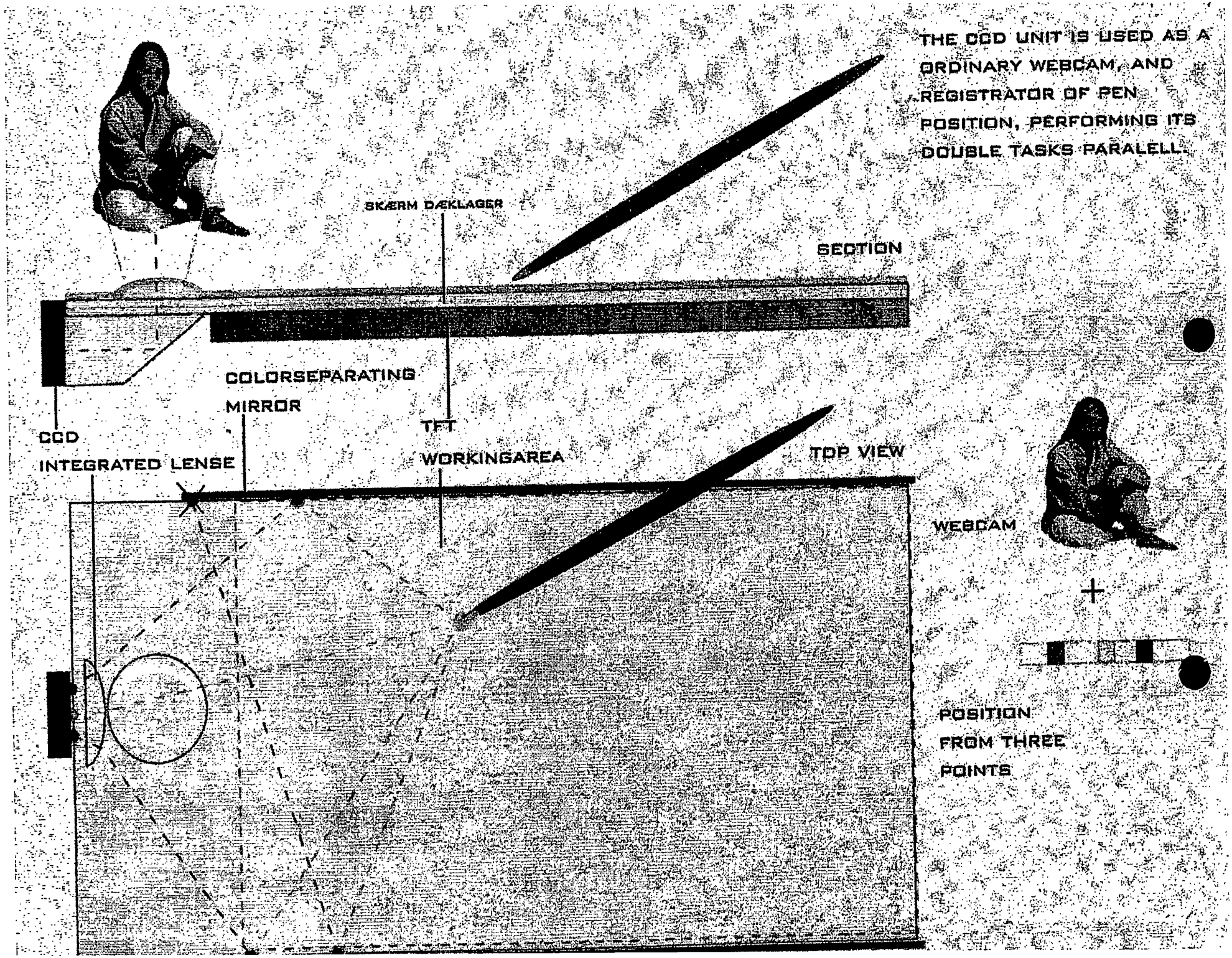
The scheme represents the key questions we need answered in order to dtermine whether or not the technology is feasible.

Can a multifocal colour selective lens with 2D sphere be produced?
Is the lens able to keep the dots in focus without distorting blur?
Is the lens able to separate the light precisely enough?
Can a colour selective lens be moulded together with appropiate transparent plastic?
Can the lens be produced in a material with an other light breaking index?
Can two external lenses gather sufficient information to enable the software and CPU to establish relative 2D positions of penpoints with specific colouration?
Can the image of an external lens be projected through a transparant top layer with mirrors?
Is it possible to produce colour selective mirrors?
Can colour selective mirrors be moulded together with appropiate transparent plastic?
Can the colour selective mirrors separate light with the required accuracy?
Can a CCD be moulded together with appropiate transparent plastic?
Is the CCD able to detect light with the required colour separation?
Is the CCD sensitivity high enough to detect IR light from a pen without internal light source?
Is the CCD able to detect IR light from a pen with internal light source?
Can the software driver establish the relative position of a pen?

Can the driver compensate for the blur accuring as a result of poor focus?
Does direct contact between the pen and the surface enhance the light conductivity?
Does a soft penpoint with larger contact area increase the light conductivity?


WITH EXTERNAL PENS
COLORSEPARATING
MIRROR
EXTERNAL LENSES
POSITION
FROM TWO
DIRECTIONS


THE CCD UNIT IS USED AS A ORDINARY WEBCAM, AND REGISTRATOR OF PEN POSITION, PERFORMING ITS DOUBLE TASKS PARALELL.
4-SKIKTS SKÄRM
SECTION
CCD
TFT
INTEGRATED LENSES
WORKINGAREA
WEBCAM
POSITION FROM THREE POINTS
TOP VIEW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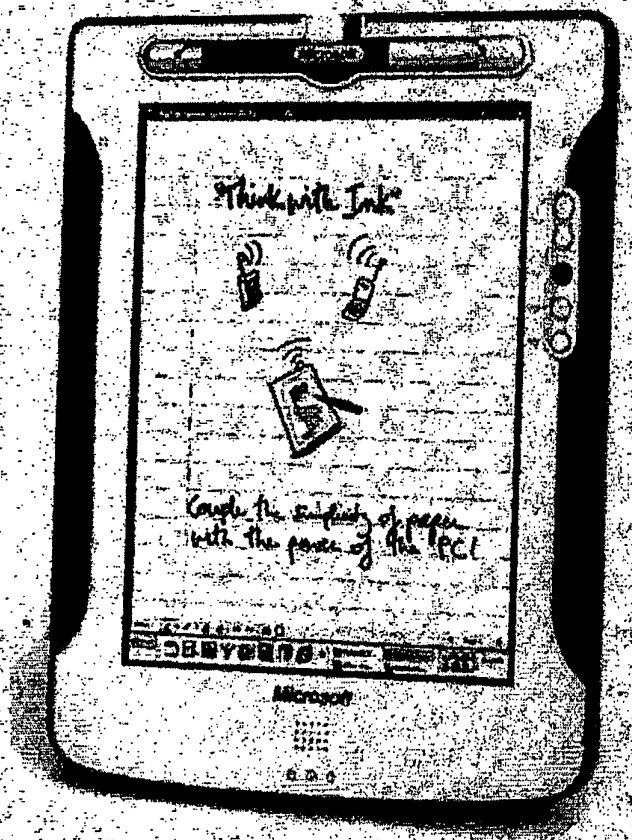
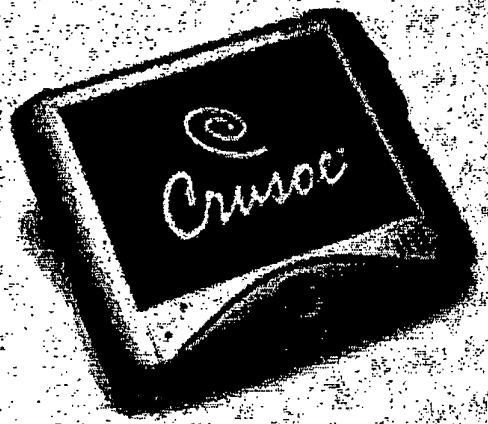
SKÆRM DÆKLAGER
SECTION
COLORSEPARATING MIRROR
CCD
INTEGRATED LENSE
TFT
WORKINGAREA
TOP VIEW
WEBCAM
POSITION FROM THREE POINTS


O-PEN

Tablet pc

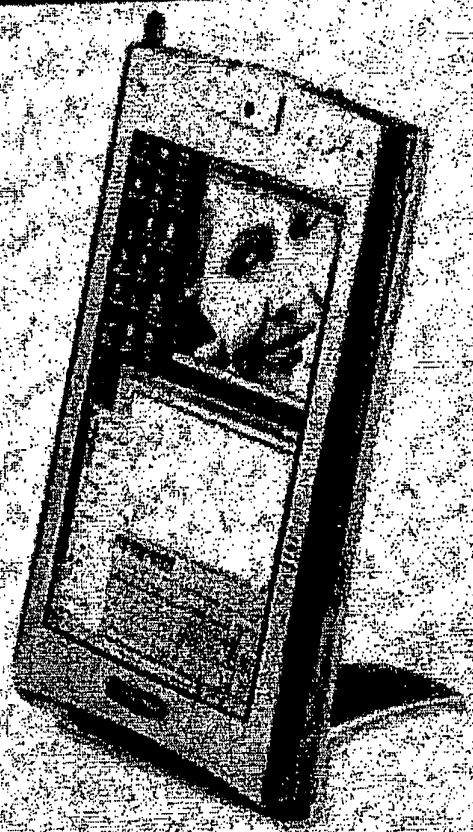
"the next major evolution of the laptop"





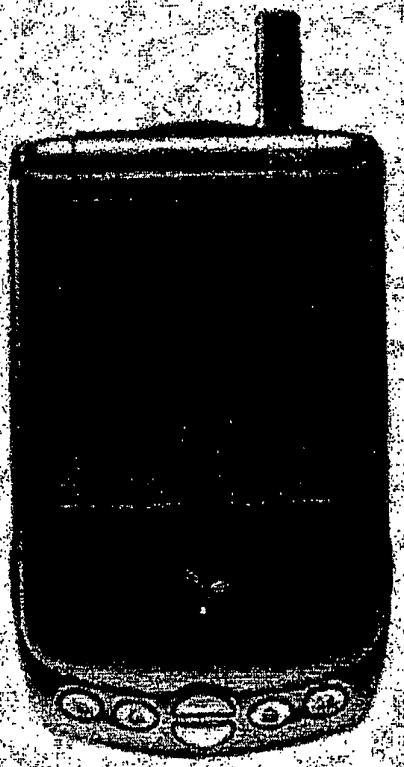
Frontpath

(progear)

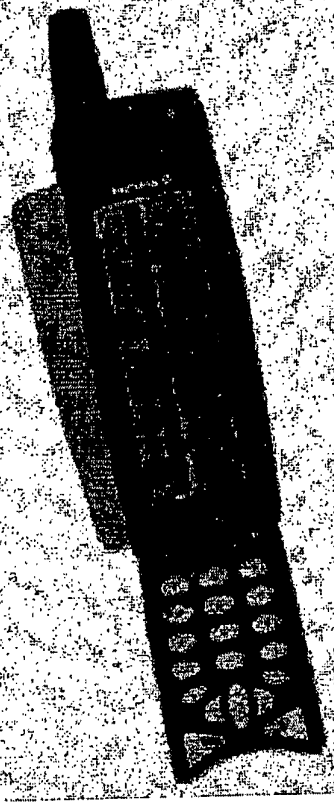


Evita (innolabs)

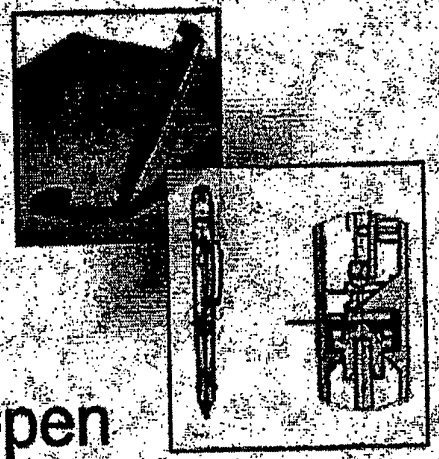
Nokia 7650



Visor treo

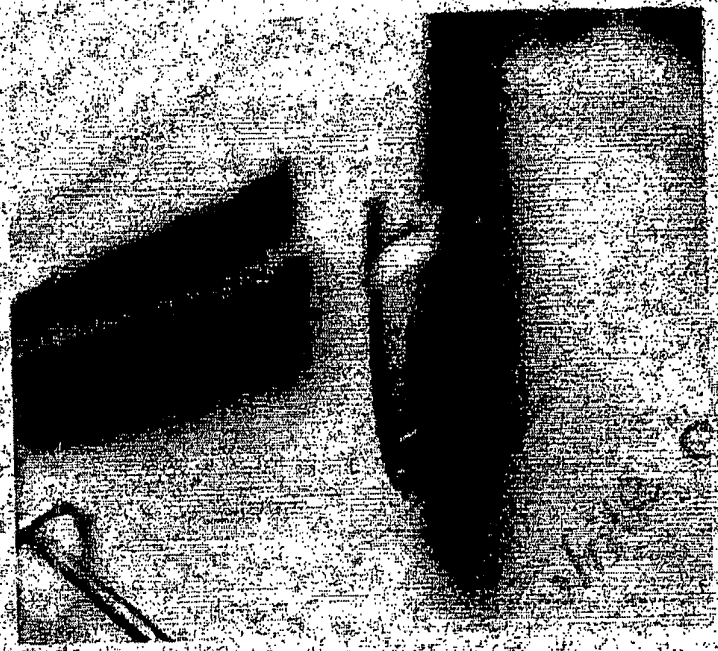


Ericsson-380e



E-pen
($179)

Ipen
($149)



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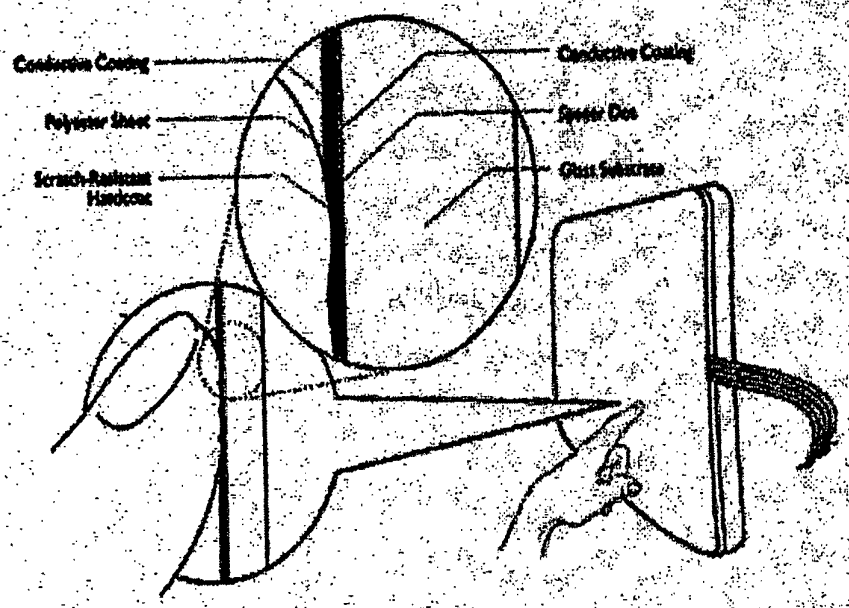
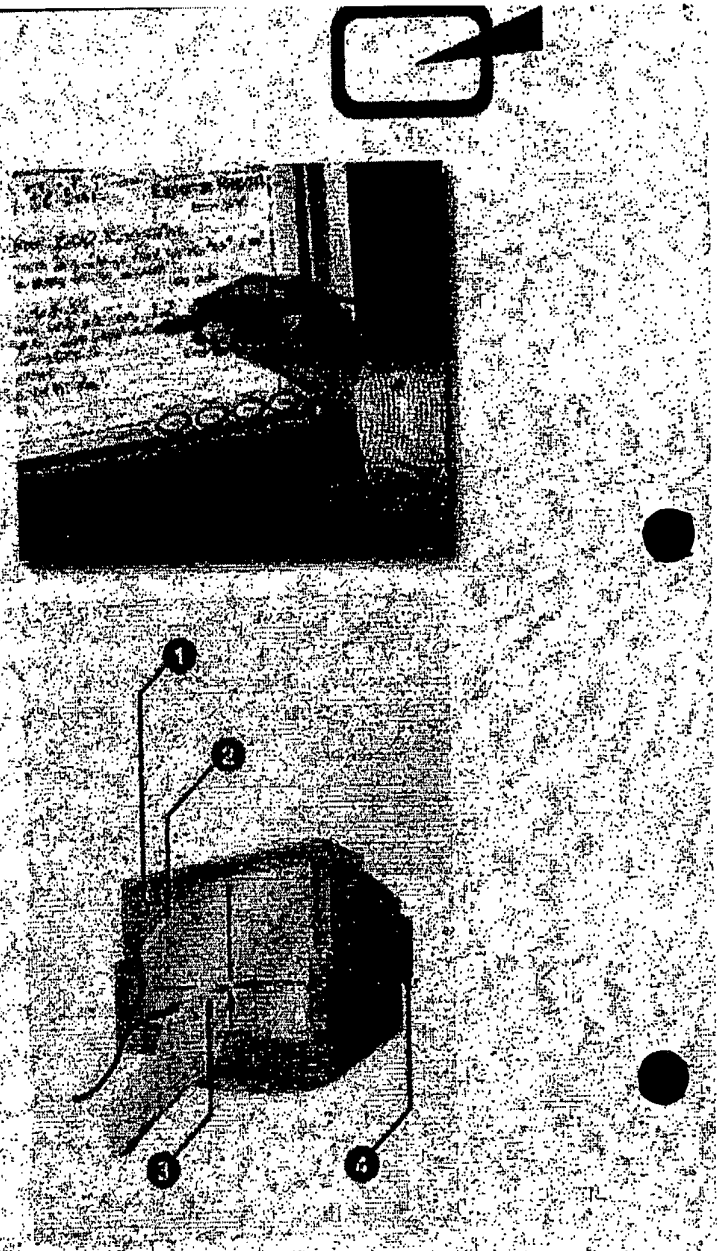
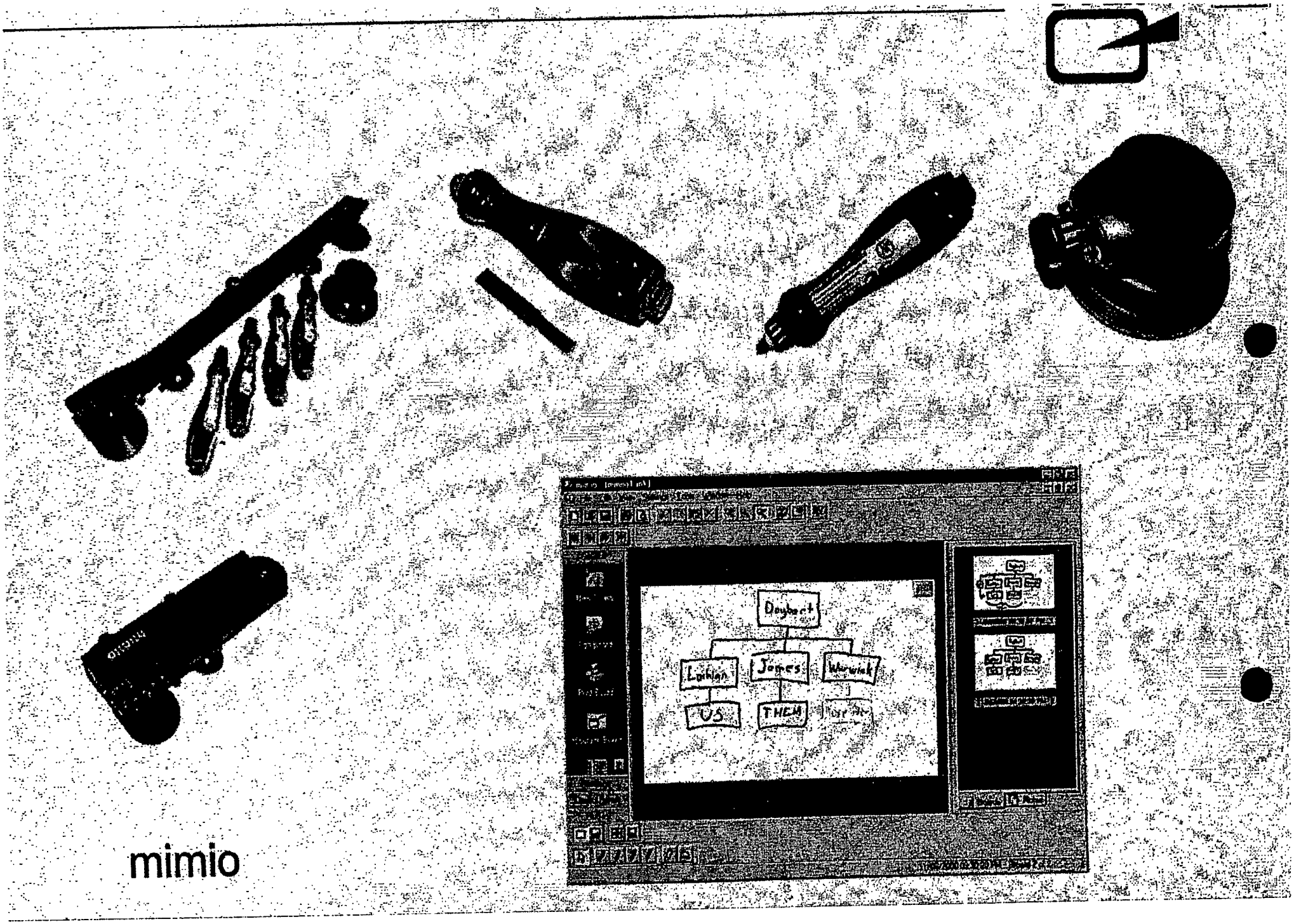


Resistive touch (3M)



Capacitive touch (3M)



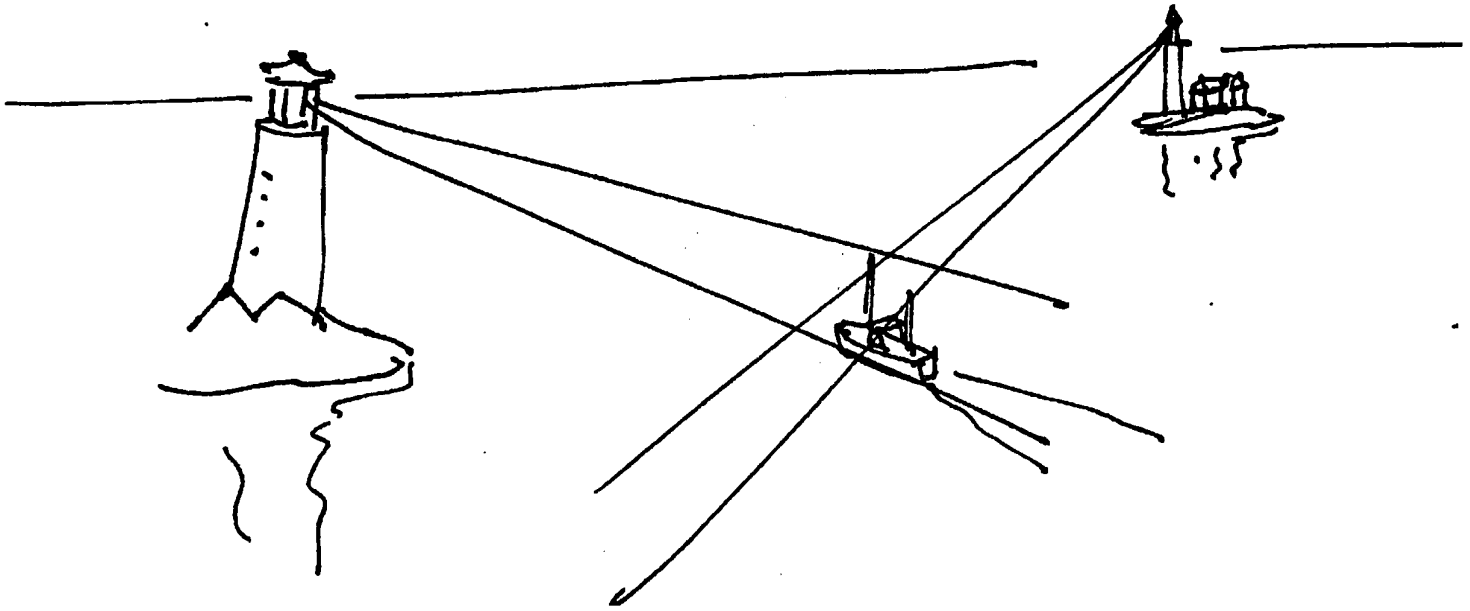
mimio

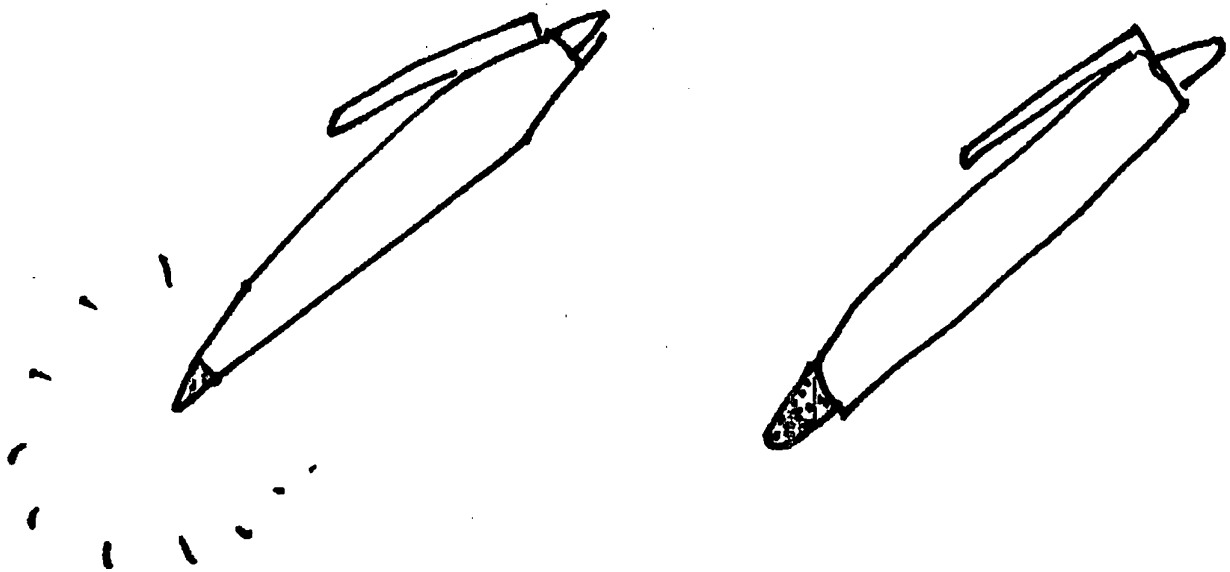
Kunderne søger et værktøj der er

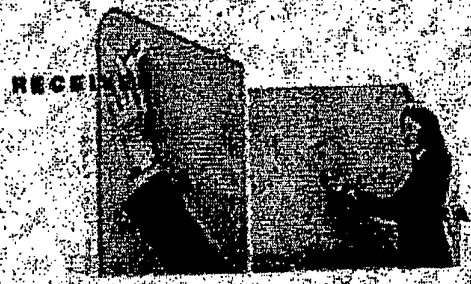
1. Intuitivt.
2. Præcist.
3. Hurtigt.
4. Ergonomisk.
5. Billigt.
6. Brugerdefineret.
7. Holdbart.
8. Disposable.
9. Mobilt.
10. Stabilt.
11. Æstetisk.
12. Interagerende.
13. Fleksibelt.

O-pen opfylder alle desse krav

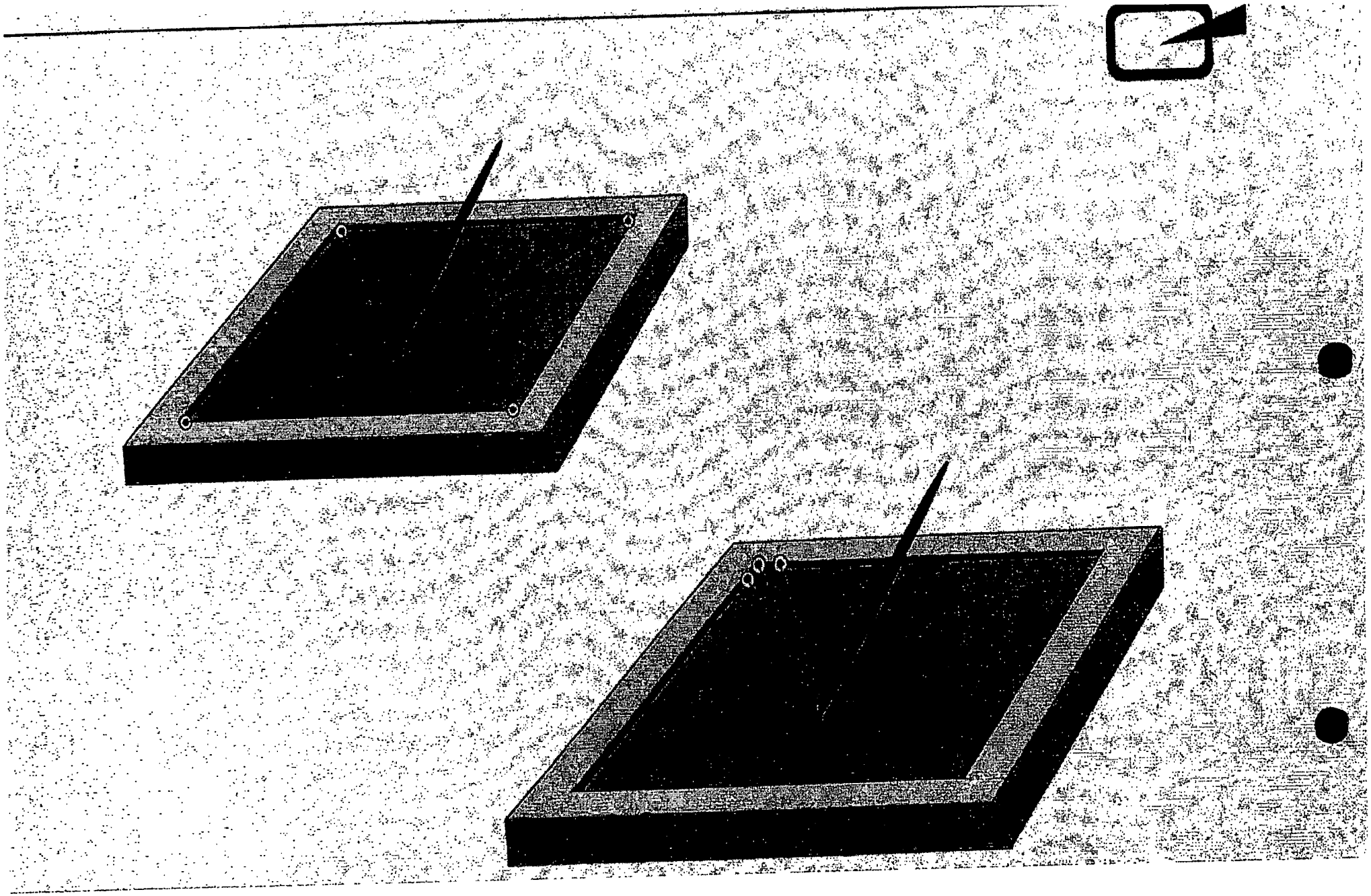
grundprinciper

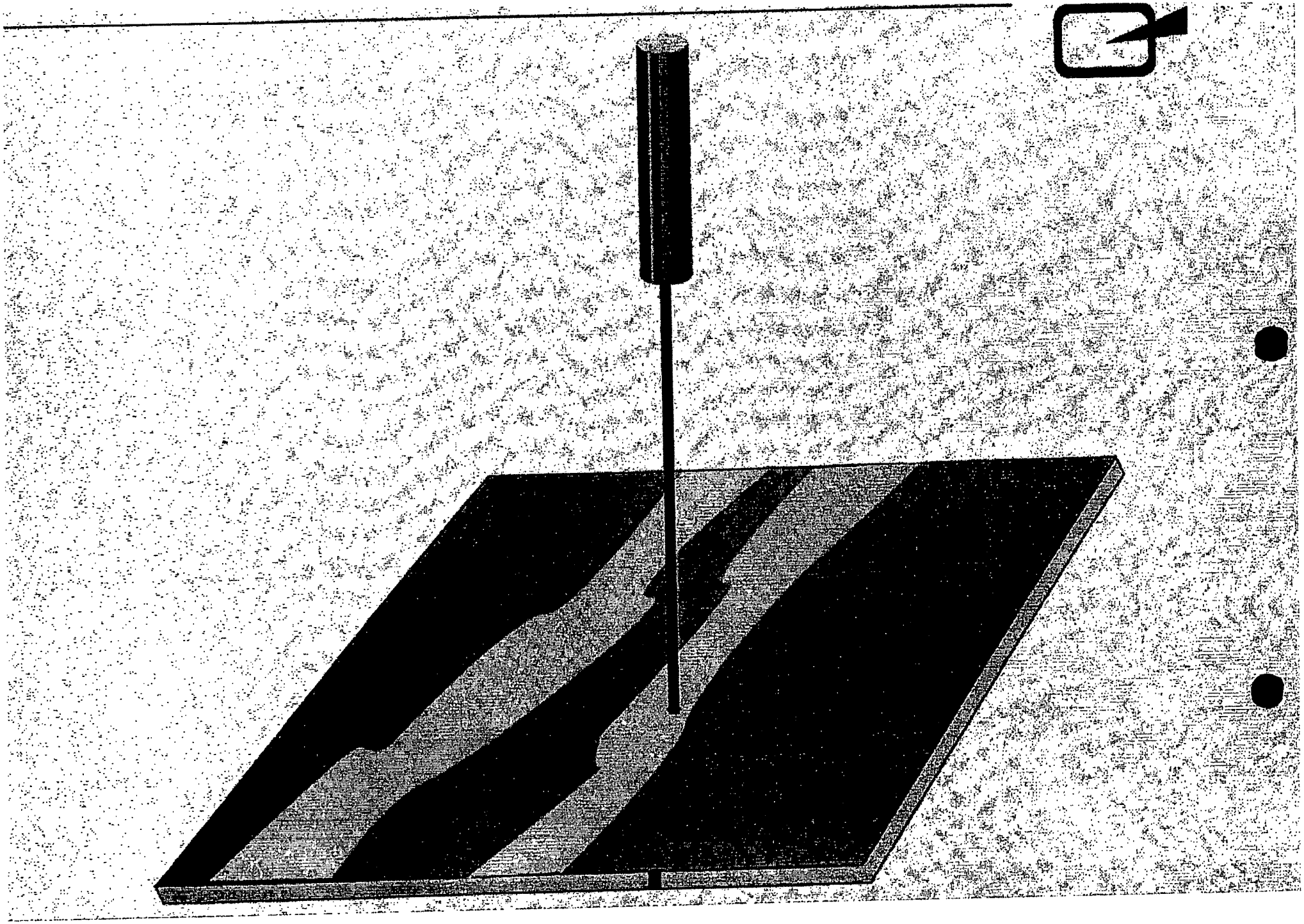


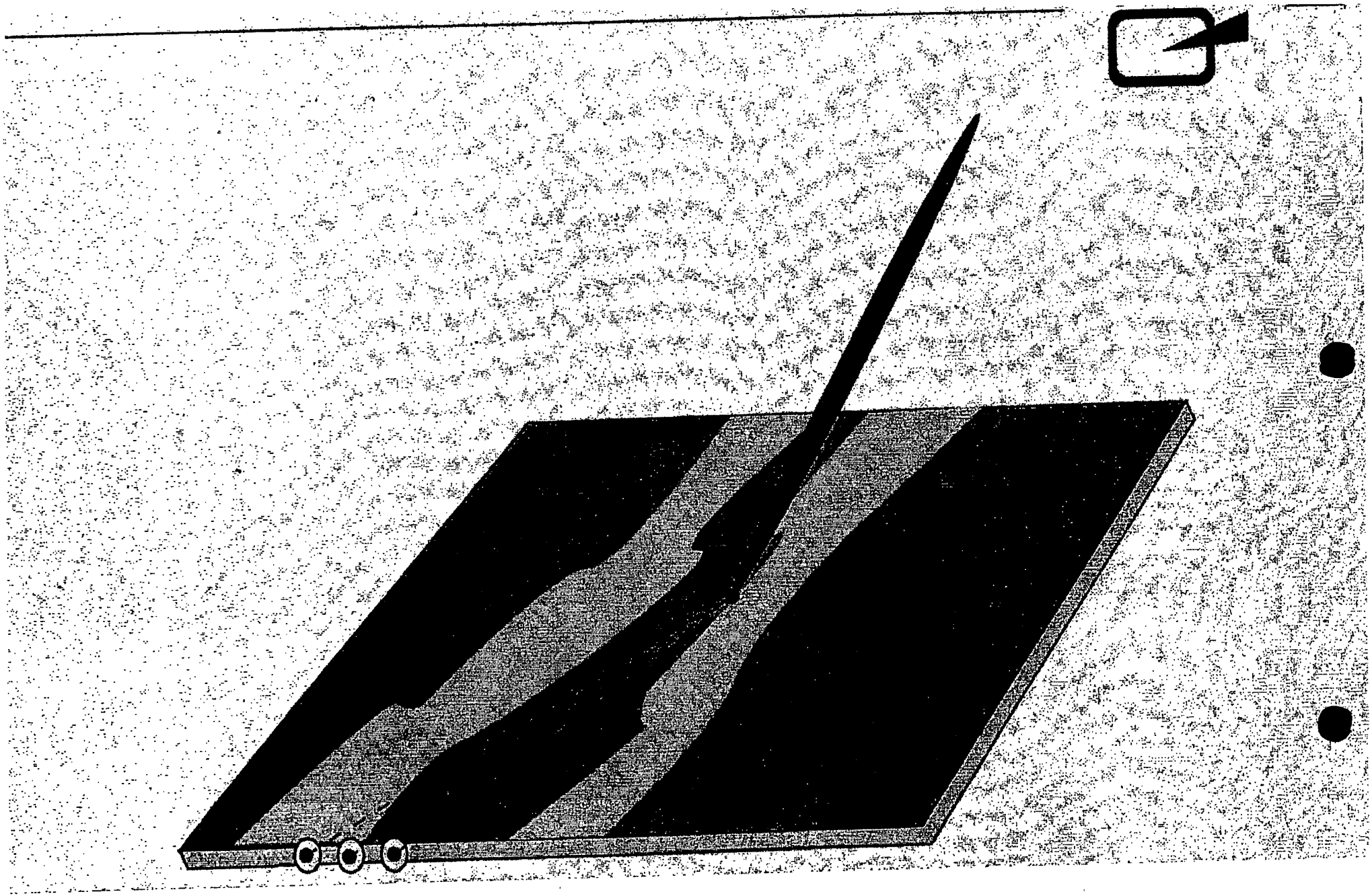


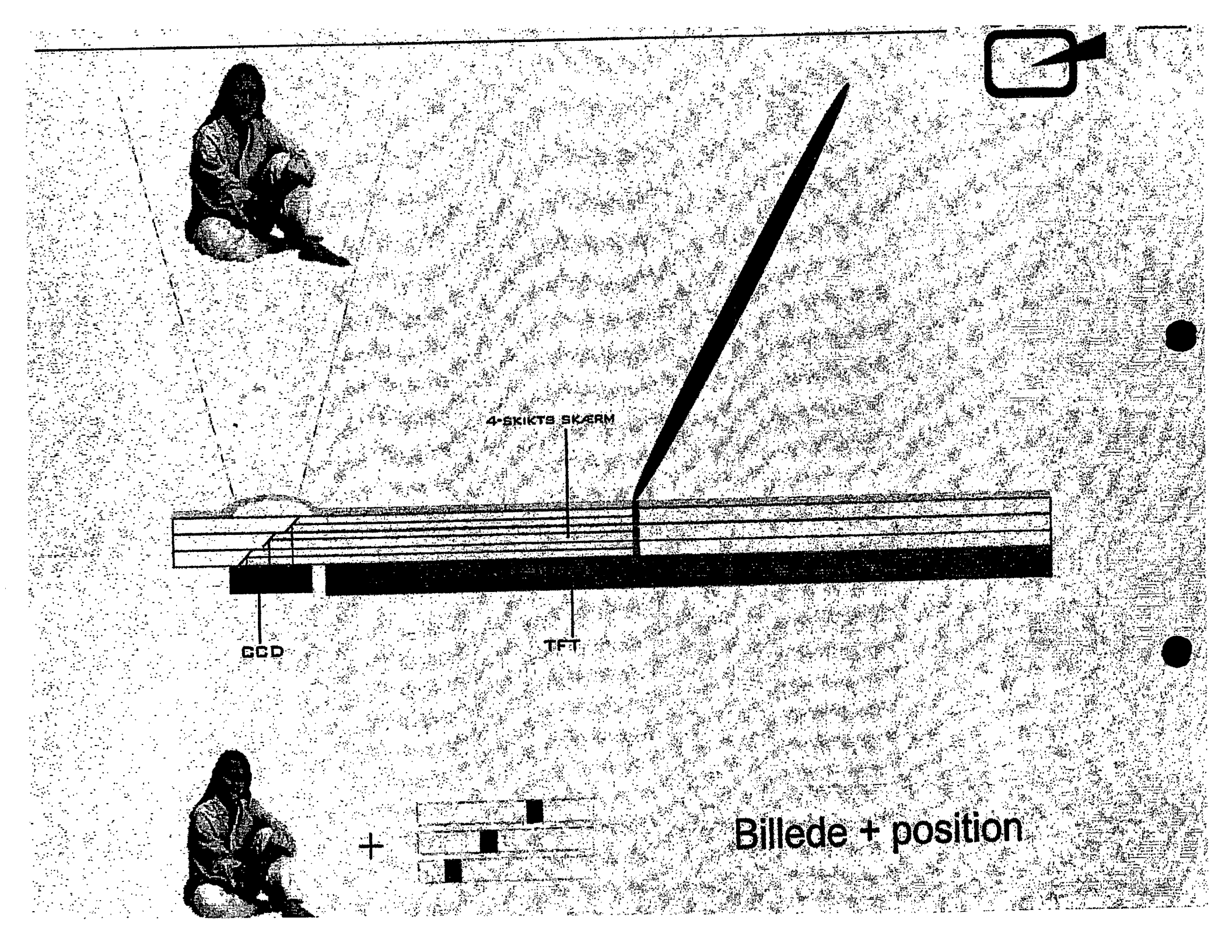


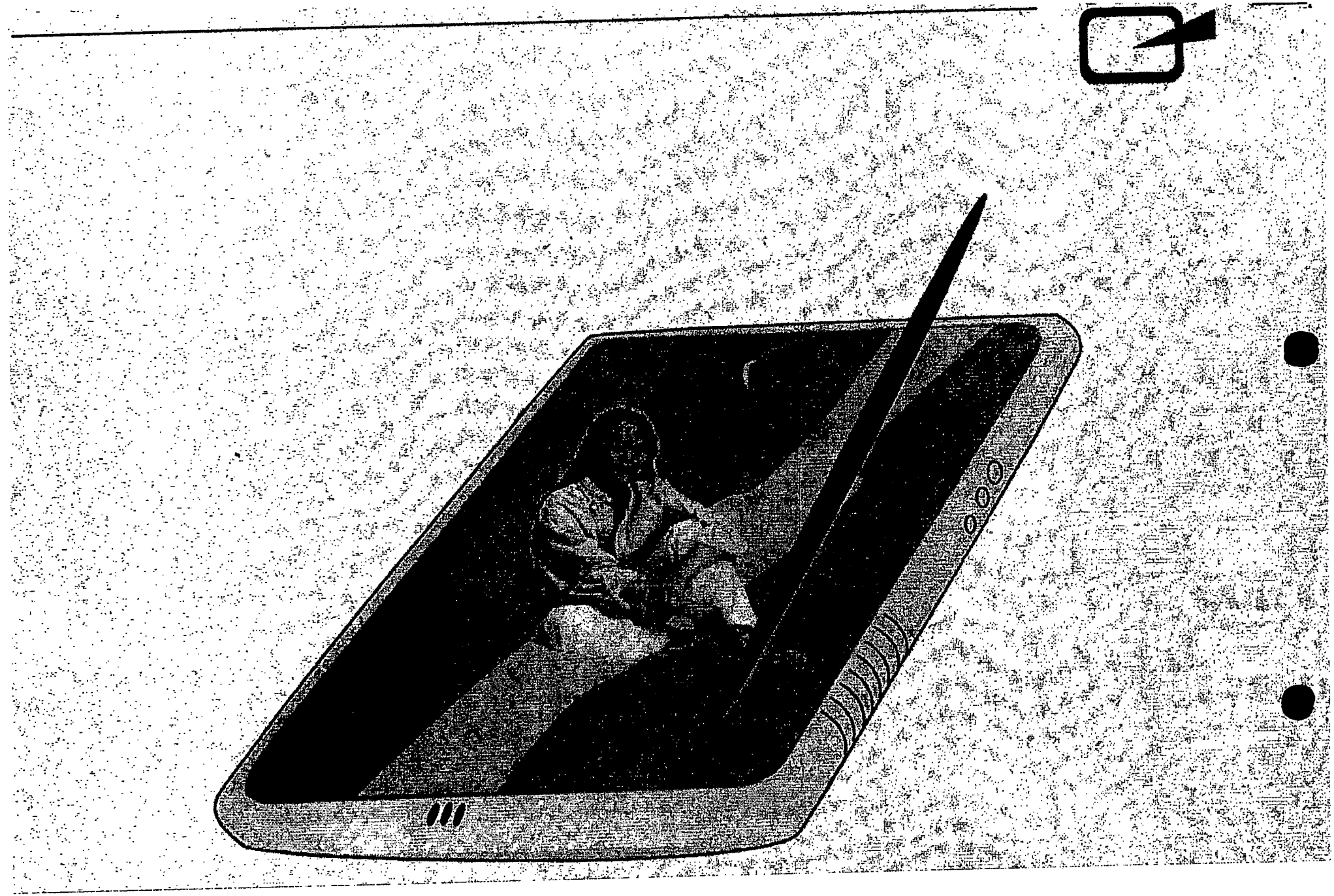
E-beam

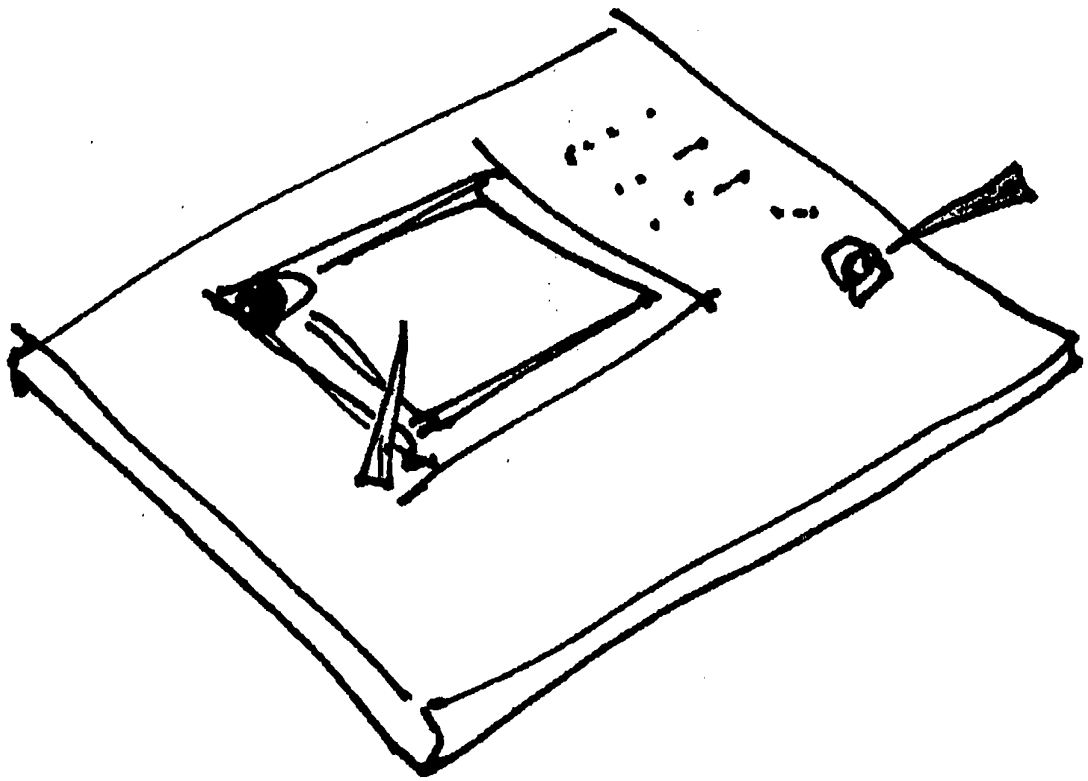


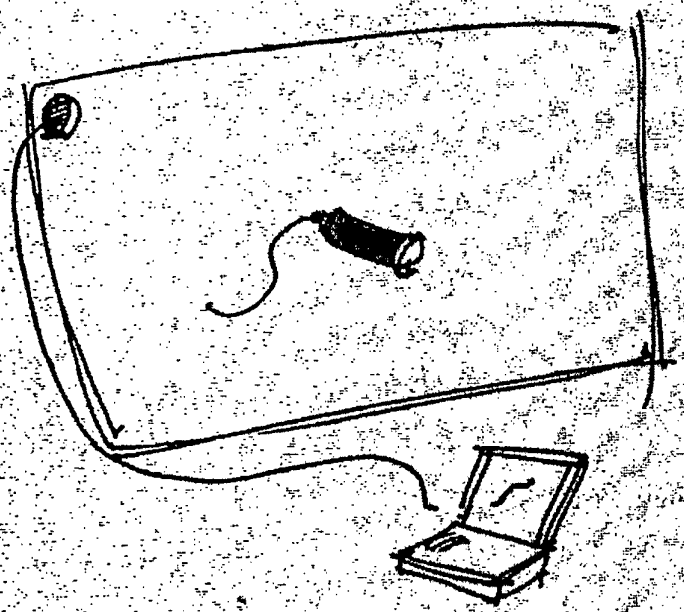


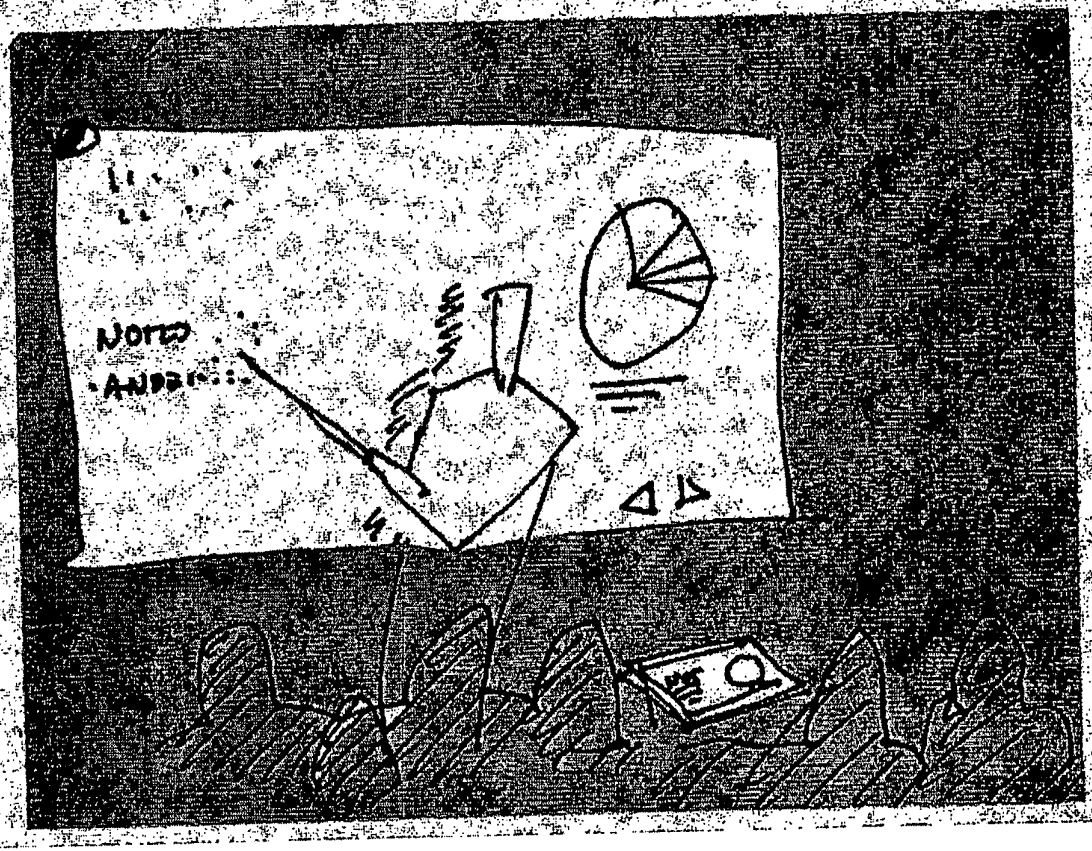



4-SKIKTS SKÄRM
CCD
TFT
+
Billede + position









O-pen teknologien rummer mulighed for en ekvivalent eller højere præcision end konkurrenterne. **O**-pen vil blive billigere og tilbyde brugerne integration på kryds og tværs mellem alle verdener fra papir og blyant til computer og mobiltelefon.